R E P O R T R E S U M E S

ED 013 881 VT 000 604

MANPOWER NEEDS AND EMPLOYMENT OPPORTUNITIES FOR WORKERS NEEDING KNOWLEDGE AND SKILL IN AGRICULTURE. TECHNICAL EDUCATION IN AND FOR RURAL AREAS, REPORT NUMBER 2.

BY- WARMBROD, J. ROBERT
ILLINOIS UNIV., URBANA, COLL. OF EDUCATION

PUB DATE 66

EDRS PRICE MF-$0.25 HC-$1.68 42P.

DESCRIPTORS- *OCCUPATIONAL SURVEYS, *OFF FARM AGRICULTURAL OCCUPATIONS, *EMPLOYMENT OPPORTUNITIES, EMPLOYMENT TRENDS, *FARMERS, FARM OCCUPATIONS, AGRICULTURAL EDUCATION, EDUCATIONAL NEEDS, ILLINOIS,

THREE TYPES OF FIRMS IN A 14-COUNTY AREA WERE SURVEYED TO DETERMINE THE NUMBER OF WORKERS WITH AGRICULTURAL COMPETENCIES REQUIRED IN THE OFF-FARM AGRICULTURAL OCCUPATIONS AND TO COMPARE EMPLOYMENT OPPORTUNITIES IN FARM AND OFF-FARM AGRICULTURAL OCCUPATIONS. OF 77,868 WORKERS IN 384 FIRMS IN AREAS OF LESS THAN 25,000 POPULATION, 18 PERCENT WERE IN JOB TITLES REQUIRING AGRICULTURAL COMPETENCY. AN INCREASE OF 35 PERCENT IN THE NUMBER OF AGRICULTURAL EMPLOYEES WOULD BE REQUIRED WITHIN 5 YEARS, AND 97 PERCENT WOULD NEED POST-HIGH SCHOOL EDUCATION. EMPLOYMENT OPPORTUNITIES WERE GREATEST IN AGRICULTURAL MACHINERY, LIVESTOCK MARKETING, SEED AND FERTILIZER, FEEDMILL AND ELEVATOR, AND AGRICULTURAL SALES AND SERVICE POSITIONS. OF 2,960 WORKERS IN AGRICULTURAL FIRMS IN AREAS OF OVER 25,000 POPULATION, 75 PERCENT WERE IN JOB TITLES REQUIRING AGRICULTURAL COMPETENCY. AN INCREASE OF 24 PERCENT IN THE NUMBER OF AGRICULTURAL EMPLOYEES WOULD BE REQUIRED WITHIN THE NEXT 5 YEARS WITH THE GREATEST OPPORTUNITIES IN HORTICULTURE, FEEDMILL AND ELEVATOR, AGRICULTURAL MACHINERY AND CONSTRUCTION, AND LIVESTOCK MARKETING JOBS. THERE WERE 22,599 COMMERCIAL FARM OPERATORS AND 5,909 HIRED FARM WORKERS IN THE 14-COUNTY AREA. IN THE NEXT 5 YEARS, 1,087 FARM OPERATORS WOULD BE NEEDED TO REPLACE OPERATORS OF FARMS WITH MORE THAN $10,000 GROSS SALES. FOR EACH FARM OPERATOR REPLACEMENT NEEDED, APPROXIMATELY 3.5 WORKERS WITH AGRICULTURAL SKILLS WOULD BE NEEDED IN NONFARM BUSINESS. (JM).

ED013881

TECHNICAL EDUCATION IN AND FOR RURAL AREAS

Report No. 2

MANPOWER NEEDS AND EMPLOYMENT OPPORTUNITIES FOR WORKERS NEEDING KNOWLEDGE AND SKILL IN AGRICULTURE

J. Robert Warmbrod

Agricultural Education Division
Vocational and Technical Education Department
College of Education
University of Illinois
Urbana, Illinois

1966

VT000604

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Report No. 2

TECHNICAL EDUCATION IN AND FOR RURAL AREAS

Research Staff

Lloyd J. Phipps, Professor, Project Director
A. H. Krebs, Professor
Paul E. Hemp, Associate Professor
J. Robert Warmbrod, Assistant Professor
Gerald R. Fuller, Assistant Professor
Roy Dillon, Graduate Assistant
Norman Ehresman, Graduate Assistant
Keith Fiscus, Graduate Assistant
Kenney Earl Gray, Graduate Assistant
Glen Hayes, Graduate Assistant
Dwight Heckert, Graduate Assistant
Martin McMillion, Graduate Assistant
Wayne Sampson, Graduate Assistant
Harvey Carley, Graduate Assistant

Project Sponsors

Agricultural Education Division
Vocational and Technical Education Department
College of Education
University of Illinois

Vocational and Technical Education Division
State of Illinois
Board of Vocational Education and Rehabilitation

Bureau of Educational Research
University of Illinois

TABLE OF CONTENTS

	Page
INTRODUCTION	1
AREAS WITH POPULATION CENTERS OF LESS THAN 25,000	2
Total Number of Workers Employed at the Time the Study Was Made	2
Number of Workers Needing a Knowledge of Agriculture	3
Number of Workers Needing a Knowledge of Agriculture--Selected Job Titles	5
AREAS WITH POPULATION CENTERS EXCEEDING 25,000	16
Total Number of Workers Employed at the Time the Study Was Made	16
Number of Workers Needing a Knowledge of Agriculture	16
Number of Workers Needing a Knowledge of Agriculture--Selected Job Titles	18
MANPOWER NEEDS AND EMPLOYMENT OPPORTUNITIES IN FARMING	26
Number of Workers Engaged in Farming Occupations	26
Number of Farm Operators Needed in Next Ten Years	26
COMPARISON OF MANPOWER NEEDS IN FARMING AND IN NONFARM OCCUPATIONS INVOLVING KNOWLEDGE AND SKILL IN AGRICULTURE	28
Total Number of Workers Employed at the Time the Study Was Made	28
Number of Workers Needed in the Future	29
SUMMARY	30
APPENDIX	33

MANPOWER NEEDS AND EMPLOYMENT OPPORTUNITIES FOR WORKERS NEEDING KNOWLEDGE AND SKILL IN AGRICULTURE[1/]

J. Robert Warmbrod

INTRODUCTION

How many workers employed in nonfarm business and industrial firms need a knowledge of agriculture to accomplish successfully their jobs? What are the employment opportunities in nonfarm businesses for persons with knowledge and skill in agriculture? How do employment opportunities in nonfarm businesses compare with employment opportunities in farming? In this report, data are presented concerning these questions.

Estimates of the number of workers employed at time the study was made who need a knowledge of agriculture and estimates of the employment opportunities for workers possessing agricultural knowledge and skill were derived from a study of a sample of business firms in a 14-county region of East-Central Illinois.[2/] Estimates were made independently for three types of business firms--Type 1, Type 2, and Type 3.[3/] Interviews were made in a total of 384 business firms in areas of the region in which the largest population center did not exceed 25,000 persons. Interviews were made in 38 Type 1 business firms in areas of the region with population centers exceeding 25,000 persons. No interviews were made in Type 2 and Type 3 business firms in areas with population centers of more than 25,000 persons. Interviews were conducted during late 1962 and the early months of 1963.

Among the data collected from each business firm in the sample was a list of job titles in which persons were employed and the number of persons working in each job title. After a preliminary study of the nature of each business firm, interviewers selected for detailed study certain job titles for which knowledge and skill in agricultural subjects were needed. Detailed information was obtained for all agricultural job titles categorized as: (1) technician job titles, (2) job titles in which workers need post-high school technical education, (3) job titles in which workers need post-high nontechnical education, and (4) job titles in which

---

1/ One of a series of reports of the study, Technical Education in and for Rural Areas, Division of Agricultural Education, Department of Vocational and Technical Education, College of Education, University of Illinois.

2/ The sampling procedure and the statistical techniques used in calculating estimates from sample data are described in the Appendix.

3/ The three types of business firms were defined as follows:
Type 1--Businesses that were agriculturally oriented.
Type 2--Businesses that were not agriculturally oriented but often employ workers who must have agricultural knowledge and skill.
Type 3--Nonagricultural businesses.

workers need no post-high school education.4/ The following data were obtained for each of the aforementioned job title categories:

a. Number of persons employed at the time the interviews were conducted.

b. Total number of different persons employed in the past five years due to business growth and employee turnover.

c. Anticipated additional persons needed in the next five years due to business growth.

d. Anticipated additional persons needed in the next 12 months due to business growth and employee turnover.

e. Percentage of employees obtained within a 25-mile radius of their present employment.

The data collected for job titles involving knowledge and skill in agriculture which were classified as professional and unskilled were limited to the number of workers employed in these positions at the time the interviews were conducted. The findings of the study concerning the number of workers employed and anticipated employment needs are presented in the following sections of this report.

AREAS WITH POPULATION CENTERS OF LESS THAN 25,000

Total Number of Workers Employed at the Time the Study was Made

Estimates indicate that there were a total of 77,868 workers employed in the business firms in areas with population centers of less than 25,000 in the 14 counties included in the study (Table I). Over one-half of these workers were

---

4/ The following definitions were used in the study:

Technician--A semi-professional, highly skilled worker who performs tasks which were at one time, and which may continue to be, performed by professional personnel; a worker whose success depends on technical information, skills, and the ability to use scientific principles in solving problems of modern design, production, distribution, and service.

Post-high school technical education--Education and training which is highly "occupation oriented" and which provides a blend of the theoretical knowledge and skills of an area of specialization in a program of shorter duration than that required for the baccalaureate degree.

Post-high school nontechnical education--Education and training for the development of specific skills; or education in liberal (nontechnical) subject areas.

No post-high school education--Education and training at the high school level only. High school graduation was considered sufficient for entry into job titles included in this category.

employed in Type 2 business firms. Approximately one-third of the workers were employed in Type 3 business firms. Only ten percent of the estimated total number of workers were employed in Type 1 business firms.

TABLE 1
ESTIMATES OF THE TOTAL NUMBER OF WORKERS EMPLOYED IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Type of business firm	Estimated total number of workers
1	8,896
2	41,533
3	27,439
Total	77,868

Number of Workers Needing a Knowledge of Agriculture

Of the 77,868 workers estimated to be employed in business firms in areas of the region with population centers of less than 25,000, it was estimated that 14,042 of these workers were performing duties in job titles where knowledge and skill in agricultural subjects are needed (Table II). Fifty-seven percent of the 14,042 workers were employed in Type 1 business firms, 37 percent were employed in Type 2 business firms, and six percent were employed in Type 3 business firms. A finding which should not be overlooked is that even in businesses classified as nonagricultural in nature some job titles were found in which a knowledge of agriculture is needed. When the estimated number of workers needing a knowledge of agriculture was compared to the estimated total number of workers employed in the

TABLE II
ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE EMPLOYED IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Level of agricultural knowledge needed	Estimated number of workers by type of business firm			Estimated total number of workers in the region
	1	2	3	
Professional	153	238	126	517
Technician	659	113	181	953
Post-high school technical education	2,656	1,841	301	4,798
Post-high school non-technical education	983	1,050	76	2,109
High school graduation only	1,189	644	0	1,833
Unskilled	2,365	1,320	147	3,832
Total	8,005	5,206	831	14,042

business firms, it was revealed that 18 percent of all the workers in nonfarm businesses, in areas of the region with population centers of less than 25,000, were employed in jobs where a knowledge of agriculture is needed. As would be expected, the percentage of all workers needing a knowledge of agriculture was highest for Type 1 business firms. Ninety percent of all workers in Type 1 business firms were performing duties in job titles where agricultural knowledge and skills are needed; 12 percent of all workers in Type 2 business firms were employed in agricultural job titles; and three percent of all workers in Type 3 business firms were working in job titles where knowledge and skill in agriculture are considered essential.

The estimates in Table II indicate the following distribution among the various levels of job titles for all workers needing a knowledge of agriculture.

Level of Agricultural Knowledge Needed	Percent of All Workers Needing a Knowledge of Agriculture
Professional	3.7
Technician	6.8
Post-high school technical education	34.1
Post-high school non-technical education	15.0
High school graduation only	13.0
Unskilled	27.3

Sixty percent of all the workers needing a knowledge of agriculture were working in job titles for which some type of post-high school education was considered necessary. An examination of the estimates shown in Table II reveals that the percentage of all workers employed in job titles for which post-high school education is considered necessary was highest for Type 3 business firms. Fifty-six percent of all workers in Type 1 business firms were employed in job titles for which post-high school education is needed, 62 percent of all workers in Type 2 business firms were mployed in job titles requiring post-high school education, while 82 percent of the workers in Type 3 business firms were employed in job titles where some level of post-high school education is needed. It should be noted also that the percentage of workers at the professional level--job titles which require at least a baccalaureate degree--is the highest for Type 3 businesses. Fifteen percent of all workers in Type 3 business firms were employed in professional positions, while in Type 1 and Type 2 business firms the comparable percentages were two and five percent, respectively.

Number of Workers Needing a Knowledge of Agriculture--Selected Job Titles[5/]

Each job title for which detailed data were obtained was classified, after a study of the data collected, into one of nine categories which describe the jobs according to tasks performed and by the nature of agricultural knowledge and skill needed to perform the job successfully. The nine descriptive job title categories were: (1) agricultural machinery and construction; (2) feedmill and elevator; (3) general agricultural sales and service; (4) horticulture; (5) livestock marketing; (6) poultry marketing and service; (7) seed and fertilizer; (8) miscellaneous, and (9) nonagricultural.[6/]

Number Workers Employed at the Time Study Was Made. Of the 14,042 workers employed in nonfarm businesses in areas of the region with population centers of less than 25,000, 70 percent (9,693) were employed in job titles for which detailed data were obtained. The distribution of these 9,693 workers among the nine descriptive job title categories is shown in Table III.

The estimates recorded in Table III indicate that approximately 10 percent of all workers needing a knowledge of agriculture were working as technicians; almost 50 percent of the workers were employed in job titles where post-high school technical education was needed; an additional 21 percent of the workers were employed in job titles categorized as requiring some post-high school nontechnical education. Only 19 percent of all the workers who need specialized knowledge and skill in agriculture were working in jobs for which high school graduation was considered adequate preparation for employment.

5/ The remainder of this section is concerned only with employment and employment opportunities in those job titles for which detailed data were obtained: (a) technician job titles; (b) job titles in which workers need post-high school technical education; (c) job titles in which workers need post-high school nontechnical education; and (d) job titles in which workers need no post-high school education. Excluded from the subsequent discussion are those workers needing a knowledge of agriculture who were employed in the following types of positions: (a) professional job titles; (b) unskilled laborers; and (c) office workers such as typists, office assistants, and filing clerks.

6/ A job was classified as nonagricultural if the tasks performed in the job indicated that knowledge and skill in agricultural subjects were secondary rather than primary in importance. Upon detailed study, many jobs classified as nonagricultural were found to involve agricultural knowledge and skill, hence the category "nonagricultural job titles involving a knowledge of agriculture." For a list of job titles identified in the study see: Lloyd J. Phipps and others, "Jobs Requiring Knowledge and Skill in Agricultural Subjects," Division of Agricultural Education, College of Education, University of Illinois, 1965.

TABLE III
ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE EMPLOYED IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Agricultural machinery and construction	161	1,552	293	285	2,291
Feedmill and elevator	87	741	62	390	1,280
General agricultural sales and service	81	266	106	26	479
Horticulture	13	232	30	39	314
Livestock marketing	0	35	245	39	319
Poultry marketing and service	34	104	51	64	253
Seed and fertilizer	434	583	413	637	2,067
Miscellaneous agricultural	75	354	698	197	1,324
Nonagricultural	78	931	211	156	1,376
Total	953	4,798	2,109	1,833	9,693

It should be noted in Table III that 7,860 of the 9,636 workers--81 percent--needing a knowledge of agriculture were employed in job titles for which some type of post-high school education was considered necessary. Seventy-eight percent of all workers needing a knowledge of agriculture who were employed in Type 1 business firms were performing jobs which require post-high school education; 83 percent of all workers employed in Type 2 business firms were performing jobs which require post-high school education; whereas 100 percent of all workers needing a knowledge of agriculture who were employed in Type 3 business firms were performing jobs which require post-high school education.

The data presented in Table III indicate that for each 100 employees in areas of the region with population centers of less than 25,000 who were working in job titles involving knowledge and skill in agriculture that:

24 were working in agricultural machinery and construction jobs,

21 were working in seed and fertilizer jobs,

14 were working in miscellaneous agricultural jobs,

14 were working in nonagricultural jobs,

13 were working in feedmill and elevator jobs,

5 were working in general agricultural sales and service jobs,

3 were working in horticulture jobs,

3 were working in poultry marketing jobs, and

3 were working in livestock marketing jobs.

The foregoing data indicate that four job title categories--agricultural machinery and construction, seed and fertilizer, feedmill and elevator, and miscellaneous--account for almost three-fourths of all workers needing a knowledge of agriculture. Over half of the workers are accounted for when the miscellaneous category is excluded from the four job title categories listed.

Distance From Which Workers Were Obtained. In areas of the region with population centers of less than 25,000, more than 80 percent of all workers employed in job titles which require a knowledge of agriculture were obtained within a 25-mile radius of their place of employment. Variations are indicated in Table IV among the three types of business firms pertaining to the percentage of workers obtained within a 25-mile radius of their place of employment.

TABLE IV

PERCENTAGE OF WORKERS EMPLOYED IN JOBS WHICH REQUIRE A KNOWLEDGE OF AGRICULTURE WHO WERE OBTAINED WITHIN A 25-MILE RADIUS OF THEIR PLACE OF EMPLOYMENT

(Areas of the Region with Population Centers of Less Than 25,000)

Level of agricultural knowledge required	Percent of workers obtained within a 25-mile radius by type of business firm			All business firms
	1	2	3	
Technician	79.3	58.5	100.0	80.2
Post-high school technical education	80.9	78.3	100.0	81.1
Post-high school non-technical education	87.6	93.7	100.0	90.3
High school graduation only	93.9	68.3	--	89.2

Number of Workers Employed in the Past Five Years. The person interviewed in each business firm was asked to indicate the number of workers who had been employed during the past five years due to business growth and employee turnover in each job title which involves knowledge and skill in agriculture.

Estimates indicate that 6,466 workers needing a knowledge of agriculture--two-thirds the number of workers needing a knowledge of agriculture employed at the time the study was conducted--had been employed during the past five years in businesses in areas with population centers of less than 25,000 (Table V).

TABLE V
ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE EMPLOYED DURING THE PAST FIVE YEARS IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Level of agricultural knowledge required	Estimated number of workers by type of business firm			Total*
	1	2	3	
Technician	431	71	212	714
Post-high school technical education	1,653	547	113	2,313
Post-high school non-technical education	942	477	38	1,457
High school graduation only	1,189	793	0	1,982
Total	4,215	1,888	363	6,466

* Number of workers employed in the past five years due to business growth and employee turnover.

Some interesting relationships appear when the number of persons employed during the past five years is compared to the number of workers employed at the time the interviews were conducted.

Level of Agricultural Knowledge Required	Number of Workers Employed in Past Five Years for Each 100 Workers Employed When Study Was Made
Technician	75.9
Post-high school technical education	48.2
Post-high school non-technical education	69.1
High school graduation only	108.1
Total	66.7

The number of workers employed during the past five years indicates employment resulting from business growth and employee turnover. Not only is the total number of workers employed during the past five years a substantial proportion

of all workers needing a knowledge of agriculture employed at the time the study was made, but the data lead to some interesting hypotheses concerning personnel change during the past five years. The data indicate that the two job levels involving the greatest degree of personnel change during the past five years, whether due to business growth, employee turnover, or both, are technician level jobs and jobs for which high school graduation was considered adequate preparation for employment. In view of technological change accompanied by a greater demand for technical and highly skilled workers and a lesser demand for semiskilled and unskilled workers, it can be surmised that the high rate of personnel change for technician level jobs during the past five years may be due primarily to business growth. Similarily, it could be argued that the high rate of personnel change during the past five years for jobs requiring only high school graduation may be due primarily to high rates of employee turnover rather than to the growth of business firms which would result in a high number of additional jobs at this level.

When the number of workers employed during the past five years in Type 1 business firms was compared to the number of workers employed in these firms at the time interviews were made, it was found that 75 workers had been employed during the past five years for each 100 workers employed at the time of interviewing. In Type 2 firms, 52 workers had been employed during the past five years for each 100 employees; in Type 3 firms, 63 workers had been employed during the past five years for each 100 employees at the time the study was made.

Estimates recorded in Table VI indicate the distribution of the number of workers employed during the past five years among the various descriptive job title categories. Over 60 percent of the workers who were employed during the past five years due to growth of business, turnover of employees, or both are accounted for by three of the job title categories--agricultural machinery and construction, seed and fertilizer, and feed mill and elevator.

When the number of workers who were employed in each job title category during the past five years was compared with the number in each category at the time interviews were conducted, the following ranking of job title categories resulted which indicates the degree of personnel change during the past five years.

TABLE VI

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE EMPLOYED DURING THE PAST FIVE YEARS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Agricultural machinery and construction	79	878	184	330	1,471
Feedmill and elevator	169	488	53	444	1,154
General agricultural sales and service	113	143	139	13	408
Horticulture	0	45	7	26	78
Livestock marketing	0	22	336	52	410
Poultry marketing and service	0	12	32	52	96
Seed and fertilizer	315	313	369	461	1,458
Miscellaneous agricultural	38	181	205	519	943
Nonagricultural	0	231	132	85	448
Total	714	2,313	1,457	1,982	6,466

Descriptive Job Title Category	Number of Workers Employed in Past Five Years for Each 100 Workers Employed When Study Was Made
Livestock marketing	129
Feedmill and elevator	90
General agricultural sales and service	85
Miscellaneous agricultural	71
Seed and fertilizer	70
Agricultural mechanics and construction	64

Descriptive Job Title Category	Number of Workers Employed in Past Five Years for Each 100 Workers Employed When Study Was Made (cont.)
Poultry marketing	38
Nonagricultural	33
Horticulture	25

Number of Workers Needed in Next Five Years. Based on the opinions of employers, estimates indicate that an additional 3,427 workers possessing a knowledge of agriculture will be needed due to growth of business firms during the next five years (Table VII). The 3,427 additional workers represent a 35-percent increase in employment, during five-year period, over the number of agricultural workers employed when the study was made. The estimates recorded in Table VII indicate that 3,338--97.4 percent--of the 3,427 additional workers required to fill positions created by business growth during the next five years will be needed in job titles which necessitate some type of post-high school education. Only 2.6 percent of the additional workers needed in the next five years would be employed in job titles where high school graduation was considered adequate preparation for employment.

TABLE VII

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT FIVE YEARS IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Level of agricultural knowledge required	Estimated number of workers by type of business firm			Total*
	1	2	3	
Technician	443	0	38	481
Post-high school technical education	1,178	219	76	1,473
Post-high school non-technical education	787	597	0	1,384
High school graduation only	63	26	0	89
Total	2,471	842	114	3,427

* Number of workers needed due to growth of business firms.

The preceding finding is emphasized further when the number of additional workers needed in the next five years is compared to the number of workers employed at the time the study was conducted It is obvious from the following data that

future employment opportunities are primarily in the technical and skilled occupations.

Level of Agricultural Knowledge Required	Number of Workers Needed in Next Five Years for Each 100 Workers Employed When the Study Was Made
Technician	50.5
Post-high school technical education	30.7
Post-high school non-technical education	65.6
High school graduation only	4.8
Total	35.3

The demand for additional workers due to business growth during the next five years appears to be highest for Type 1 and Type 2 business firms. Ninety-seven percent of the 3,427 additional workers needed in the next five years will be needed in Type 1 and Type 2 businesses--72 percent of all workers needed will be employed in Type 1 business firms alone. For each 100 workers employed in Type 1 business firms when interviews were conducted, 45 additional workers will be needed during the next five years due to business growth. Comparable data indicating future employment opportunities in Type 2 and Type 3 business firms indicate, respectively, 23 and 20 additional workers needed in the next five years for each 100 workers employed at the time the businesses were studied.

Table VIII indicates the number of workers needed in the next five years for each descriptive job title category. Seventy-five percent of the 3,427 additional workers needed in the next five years to meet employment demands resulting from business growth will be employed in four job title categories--agricultural machinery and construction, livestock marketing, seed and fertilizer, and miscellaneous agricultural.

When employment needs during the next five years for each job title category were compared to the number of workers employed in each job title category at the time the study was conducted, variation in the rate or degree of increase in employment among job title categories becomes evident. The following data indicate that the highest rates of increase in employment will occur in those job title categories pertaining to marketing, sales, and service. Anticipated increases in employment during the next five years due to business growth were 20 percent, or more, in excess to present employment for eight of the nine job title categories.

TABLE VIII

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT FIVE YEARS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Agricultural machinery and construction	84	597	93	23	797
Feedmill and elevator	22	213	13	10	258
General agricultural sales and service	13	157	56	0	226
Horticulture	26	76	0	3	105
Livestock marketing	0	0	529	1	530
Poultry marketing and service	51	13	44	3	111
Seed and fertilizer	247	230	108	23	608
Miscellaneous agricultural	38	44	456	26	564
Nonagricultural	0	143	85	0	228
Total	481	1,473	1,384	89	3,427

Descriptive Job Title Category	Number of Workers Needed in Next Five Years for Each 100 Workers Employed When the Study Was Made
Livestock marketing	166
General agricultural sales and service	47
Poultry marketing	44
Miscellaneous agricultural	43
Agricultural machinery and construction	35
Horticulture	33

Descriptive Job Title Category	Number of Workers Needed in Next Five Years for Each 100 Workers Employed When the Study Was Made (cont.)
Seed and fertilizer	29
Feedmill and elevator	20
Nonagricultural	17

Number of Workers Needed in Next Twelve Months. Estimates reported in Table IX indicate that 1,908 agricultural workers will be needed in the next 12 months to meet the demand for additional workers due to business growth and employee turnover in business firms in areas of the region with population centers of less than 25,000. So, more than one-half of the estimated number of agricultural workers needed for business growth during the next five years will be needed immediately, if the demands for workers resulting both from growth and turnover are to be met.

As was the case for additional workers needed for growth of businesses over a five-year period, most of the additional workers needed during the next 12 months will be needed for employment in job titles which require post-high school education. Eighty-six percent of the 1,908 workers needed during the next 12 months will be needed for technical jobs or jobs for which post-high school technical or nontechnical education is needed.

The 1,908 additional workers needed in the next 12 months to meet demands for business growth and employee turnover represent a 20-percent increase, during one year, over the number of agricultural workers employed when interviews were conducted. Anticipated employment needs during the next 12 months in jobs requiring post-high school education showed a 21-percent increase over present employment; whereas, anticipated employment needs during the next 12 months in jobs where high school graduation was considered adequate preparation for employment showed a 15-percent increase over employment at the time interviews were conducted.

TABLE IX

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT TWELVE MONTHS IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Level of agricultural knowledge required	Estimated number of workers by type of business firm			Total*
	1	2	3	
Technician	290	0	38	328
Post-high school technical education	613	91	38	742
Post-high school non-technical education	216	349	0	565
High school graduation only	202	71	0	273
Total	1,321	511	76	1,908

* Number of workers needed in the next 12 months due to business growth and employee turnover.

A comparison of the number of workers needed in the next five years for growth of businesses with the number of workers needed during the next 12 months for business growth and employee turnover indicate some interesting relationships The estimated number of workers needed for business growth and employee turnover during the next 12 months in job titles requiring high school graduation only is more than three times the number of workers needed for employment in these job titles during the next five years due to business growth alone. When job titles requiring some type of post-high school education are compared, the data indicate the number of workers needed in the next five years to meet the demand for business growth is more than twice the number of workers needed in these job titles during the next 12 months due to business growth and employee turnover. These data indicating future employment opportunities tend to support the hypothesis that the employee turnover rate is highest in those job titles requiring the least amount of formal education. Data cited earlier in the report indicating the degree of personnel change during the past five years due to business growth and employee turnover support this hypothesis also.

Estimates presented in Table X indicate the number of workers needed in each descriptive job title category during the next 12 months due to business growth and employee turnover. As previous data have indicated, four of the job title categories account for a majority of the workers needed in the next 12 months. Eighty-one percent of the 1,908 workers will be needed in the following descriptive job title categories: agricultural machinery and construction, miscellaneous agricultural, seed and fertilizer, and feedmill and elevator.

TABLE X

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT TWELVE MONTHS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN AREAS OF THE REGION WITH POPULATION CENTERS OF LESS THAN 25,000

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Agricultural machinery and construction	60	318	54	54	486
Feedmill and elevator	0	120	13	32	165
General agricultural sales and service	27	81	9	0	117
Horticulture	13	45	0	13	71
Livestock marketing	0	0	77	0	77
Poultry marketing and service	26	0	32	26	84
Seed and fertilizer	164	102	59	77	402
Miscellaneous agricultural	38	63	321	71	493
Nonagricultural	0	13	0	0	13
Total	328	742	565	273	1,908

When anticipated employment needs during the next 12 months were compared with employment in the various job title categories at the time interviews were conducted, the rate or degree of increase in employment is greatest in the marketing, sales, and service occupations.

Descriptive Job Title Category	Number of Workers Needed in Next Twelve Months for Each 100 Workers Employed When the Study Was Made
Miscellaneous agricultural	37
Poultry marketing	33
General agricultural sales and service	24
Livestock marketing	24
Horticulture	23
Agricultural machinery and construction	21
Seed and fertilizer	19
Feedmill and elevator	13
Nonagricultural	1

AREAS WITH POPULATION CENTERS EXCEEDING 25,000

Total Number of Workers Employed at the Time the Study Was Made

Estimates derived from interviews in 38 Type 1 business firms in areas of the region with population centers exceeding 25,000 indicate that 2,960 workers were employed in Type 1 businesses in the 14 counties of the region. No interviews were made in Type 2 and Type 3 business firms in areas with population centers of more than 25,000.

Number of Workers Needing a Knowledge of Agriculture

Of the 2,960 workers estimated to be employed in Type 1 business firms in areas of the region with population centers exceeding 25,000, it was estimated that 2,231 of these workers were performing jobs which involved knowledge and skill in agricultural subjects (Table XI). So, 75 percent of all workers in Type 1 businesses in areas with population centers exceeding 25,000 need a knowledge of agriculture. In contrast 90 percent of all workers in Type 1 businesses in areas with population centers of less than 25,000 were employed in job titles involving knowledge and skill in agriculture.

TABLE XI
ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE EMPLOYED IN TYPE 1 BUSINESS FIRMS IN AREAS OF THE REGION WITH POPULATION CENTERS EXCEEDING 25,000

Level of agricultural knowledge needed	Estimated total number of workers in the region
Professional	36
Technician	471
Post-high school technical education	652
Post-high school non-technical education	118
High school graduation only	421
Unskilled	533
Total	2,231

The data recorded in Table XI indicate that more than one-half of all workers needing a knowledge of agriculture who were employed in Type 1 businesses were working in job titles which require some education beyond the high school level. The estimates recorded in Table XI indicate the following distribution among the various levels of job titles for all workers needing a knowledge of agriculture.

Level of Agricultural Knowledge Needed	Percent of All Workers Needing a Knowledge of Agriculture
Professional	1.6
Technician	21.1
Post-high school technical education	29.2
Post-high school non-technical education	5.3
High school graduation only	18.9
Unskilled	23.9

Number of Workers Needing a Knowledge of Agriculture--Selected Job Titles[7/]

Number Workers Employed at the Time Study Was Made. Of the 2,231 workers needing a knowledge of agriculture who were employed in the nonfarm business and industrial firms in areas of the region with population centers exceeding 25,000, 1,662 were employed in job titles for which detailed data were obtained. The distribution of these 1,662 workers among the nine descriptive job title categories is shown in Table XII. Twenty-eight percent of all employees were working as technicians; 39 percent were employed in job titles which require post-high school technical education; and seven percent were performing duties which require post-high school nontechnical education. The remaining 25 percent of the workers needing a knowledge of agriculture were employed in job titles for which high school graduation is considered adequate preparation for employment.

The data presented in Table XII indicate that for each 100 employees in Type 1 businesses who are working in job titles involving knowledge and skill in agriculture that:

37 were working in seed and fertilizer jobs,

16 were working in general agricultural sales and service jobs,

12 were working in miscellaneous agricultural jobs,

10 were working in horticulture jobs,

9 were working in agricultural machinery and construction jobs,

9 were working in feedmill and elevator jobs,

4 were working in livestock marketing jobs,

2 were working in nonagricultural jobs, and

1 was working in a poultry marketing job.

7/ The remainder of this section is concerned only with employment and employment opportunities in those job titles for which detailed data were obtained: (a) technician job titles; (b) job titles in which workers need post-high school technical education; (c) job titles in which workers need post-high school nontechnical education; and (d) job titles in which workers need no post-high school education. Excluded were those workers needing a knowledge of agriculture who were employed in the following types of jobs: (a) professional job titles; (b) unskilled laborers, and (c) office workers such as typists, office assistants, and filing clerks.

TABLE XII

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE EMPLOYED IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN TYPE 1 BUSINESS FIRMS IN AREAS OF THE REGION WITH POPULATION CENTERS EXCEEDING 25,000

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Agricultural machinery and construction	36	91	27	0	154
Feedmill and elevator	91	63	0	0	154
General agricultural sales and service	27	181	46	7	261
Horticulture	0	145	18	0	163
Livestock marketing	0	72	0	0	72
Poultry marketing and service	9	9	0	0	18
Seed and fertilizer	154	36	18	414	622
Miscellaneous agricultural	136	46	9	0	191
Nonagricultural	18	9	0	0	27
Total	471	652	118	421	1,662

It is interesting to note that 75 percent of the workers were employed in four of the nine descriptive job title categories. The four job title categories accounting for three-fourths of all workers--seed and fertilizer, general agricultural sales and service, miscellaneous, and horticulture--differ somewhat from the four job title categories accounting for most of the workers needing a knowledge of agriculture in areas of the region with population centers of less than 25,000. General agricultural sales and service jobs and horticulture jobs account for a greater percentage of all workers in areas of the region with population centers exceeding 25,000 than in areas with population centers of less than 25,000; whereas, agricultural machinery and construction jobs and feedmill and elevator jobs account for a greater percentage of all workers in areas of the region with population centers of less than 25,000 than in areas with population centers exceeding 25,000.

Distance From Which Workers Were Obtained. With the exception of workers employed as technicians, over 85 percent of all workers employed in jobs involving knowledge and skill in agriculture were obtained within a 25-mile radius of their place of employment. Table XIII indicates that 61 percent

of the workers employed as technicians were obtained within a 25-mile radius of their place of employment.

TABLE XIII

PERCENTAGE OF WORKERS EMPLOYED IN JOBS WHICH REQUIRED A KNOWLEDGE OF AGRICULTURE WHO WERE OBTAINED WITHIN A 25-MILE RADIUS OF THEIR PLACE OF EMPLOYMENT

(Areas of the Region with Population Centers Exceeding 25,000)

Level of agricultural knowledge required	Percent of workers obtained within a 25-mile radius
Technician	61.3
Post-high school technical education	88.6
Post-high school non-technical education	85.7
High school graduation only	100.0

Number of Workers Employed in the Past Five Years. Estimates recorded in Table XIV indicate that 1,097 persons had been employed during the past five years to meet the demand for workers possessing agricultural knowledge and skill which was created by business growth and employee turnover. For each 100 persons employed at the time interviews were made, 66 persons had been employed during the past five years in Type 1 business firms in areas with population centers exceeding 25,000. For each 100 workers employed at the time of the study in job titles which required some post-high school education, 55 workers had been employed during the past five years due to business growth and employee turnover; for each 100 workers employed at the time of the study in job titles for which high school graduation was considered adequate preparation for employment, 99 workers had been employed during the past five years due to business growth and employee turnover. A comparison of employment rates during the past five years for workers needing post-high school education and those not needing post-high school education leads to the observation that employment opportunities during the past five years due to business growth, employee turnover, or both were greater for the latter than the former. As was indicated in the discussion pertaining to areas of the region with population centers of less than 25,000, the most logical explanation of this difference in rate of employment is that employee turnover was much higher in jobs which require high school graduation only than was employee turnover in jobs which require some type of post-high school education.

TABLE XIV

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE EMPLOYED DURING THE PAST FIVE YEARS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN TYPE 1 BUSINESS FIRMS IN AREAS OF THE REGION WITH POPULATION CENTERS EXCEEDING 25,000

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed*				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school education	Total
Agricultural machinery and construction	17	81	9	0	107
Feedmill and elevator	62	55	0	0	117
General agricultural sales and service	17	73	55	9	154
Horticulture	0	9	18	0	27
Livestock marketing	0	18	0	0	18
Poultry marketing and service	9	0	0	0	9
Seed and fertilizer	141	45	0	408	594
Miscellaneous agricultural	44	9	18	0	71
Nonagricultural	0	0	0	0	0
Total	290	290	100	417	1,097

* Number of workers employed in the past five years due to business growth and employee turnover.

The number of workers employed in seed and fertilizer jobs during the past five years accounted for 54 percent of all workers who were employed during the period. Approximately two-thirds of the workers employed in seed and fertilizer jobs during the past five years were working in job titles for which high school graduation is considered adequate preparation for employment. During the past five years, substantial numbers of workers had been employed also in the following descriptive job title categories: general agricultural sales and service, feedmill and elevator, and agricultural machinery and construction.

When the number of workers employed during the past five years in each job title category was compared to the number of workers employed in each category at the time interviews were made, the following ranking of job title categories resulted which indicates the rate or degree of change in employment during the past five years.

Descriptive Job Title Category	Number of Workers Employed in Past Five Years for Each 100 Workers Employed When the Study Was Made
Seed and fertilizer	95
Feedmill and elevator	76
Agricultural machinery and construction	70
General agricultural sales and service	59
Poultry marketing and service	50
Miscellaneous agricultural	37
Livestock marketing	25
Horticulture	17
Nonagricultural	0

Number of Workers Needed in Next Five Years. Employers estimated that 407 additional workers would be needed during the next five years due to business growth to fill positions which involve knowledge and skill in agriculture (Table XV). This is a 24-percent increase in the number of employees needed over a five-year period in Type 1 business firms in areas of the region with population centers exceeding 25,000. As was the case for business firms in areas of the region with population centers of less than 25,000 the need for additional workers to fill jobs created by business growth is limited primarily to those jobs for which some post-high school education is considered necessary. Ninety-eight percent of the 407 workers needed during the next five years will be needed for jobs which require post-high school education.

TABLE XV

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT FIVE YEARS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN TYPE 1 BUSINESS FIRMS IN AREAS OF THE REGION WITH POPULATION CENTERS EXCEEDING 25,000

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed*				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Agricultural machinery and construction	18	9	9	0	36
Feedmill and elevator	82	9	0	0	91

TABLE XV

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT FIVE YEARS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN TYPE 1 BUSINESS FIRMS IN AREAS OF THE REGION WITH POPULATION CENTERS EXCEEDING 25,000 (cont.)

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed*				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
General agricultural sales and service	0	0	9	9	18
Horticulture	0	118	36	0	154
Livestock marketing	0	45	0	0	45
Poultry marketing and service	0	0	0	0	0
Seed and fertilizer	9	0	0	0	9
Miscellaneous agricultural	45	9	0	0	54
Nonagricultural	0	0	0	0	0
Total	154	190	54	9	407

* Number of workers needed due to growth of business firms.

More than one-third of all the workers needed during the next five years due to business growth are needed for employment in horticulture jobs. Estimates of employers indicate also that employment opportunities in Type 1 business firms in areas of the region exceeding 25,000 population can readily be found in feed-mill and elevator jobs, miscellaneous agricultural jobs, livestock marketing jobs, and agricultural machinery and construction jobs. Anticipated employment needs expressed as a percentage of the number of workers employed at the time the study was conducted indicate the following rates of increase in employment during the next five years due to business growth.

Descriptive Job Title Category	Number of Workers Needed in Next Five Years for Each 100 Workers Employed When the Study Was Made
Horticulture	94
Livestock marketing	62
Feedmill and elevator	59
Miscellaneous agricultural	28

Descriptive Job Title Category	Number of Workers Needed in Next Five Years for Each 100 Workers Employed When the Study Was Made (cont.)
Agricultural machinery and construction	23
General agricultural sales and service	7
Seed and fertilizer	1
Poultry marketing and service	0
Nonagricultural	0

Number of Workers Needed in Next Twelve Months. Estimates recorded in Table XVI indicate that 181 additional workers will be needed in Type 1 businesses in areas of the region with population centers exceeding 25,000 during the next 12 months due to business growth and employee turnover. The employers interviewed indicated that all workers needed in the next 12 months for business growth and employee turnover will be needed to fill positions which require post-high school education.

One-third of the workers needed in the next 12 months will be needed for employment in horticulture jobs; one-fourth of the workers will be needed for employment in feedmill and elevator jobs; and, one-fifth of the workers will be needed for employment in agricultural machinery and construction jobs. The remaining one-fifth of the 181 workers needed during the next 12 months due to business growth and employee turnover are distributed among the following job title categories: livestock marketing, general agricultural sales and service, seed and fertilizer, and miscellaneous agricultural.

TABLE XVI

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT TWELVE MONTHS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN TYPE 1 BUSINESS FIRMS IN AREAS OF THE REGION WITH POPULATION CENTERS EXCEEDING 25,000

	Estimated number of workers by level of agricultural knowledge needed*				
Descriptive job title category	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Agricultural machinery and construction	9	18	9	0	36
Feedmill and elevator	36	9	0	0	45
General agricultural sales and service	0	0	9	0	9

TABLE XVI

ESTIMATES OF THE NUMBER OF WORKERS NEEDING A KNOWLEDGE OF AGRICULTURE NEEDED IN THE NEXT TWELVE MONTHS IN EACH DESCRIPTIVE JOB TITLE CATEGORY IN TYPE 1 BUSINESS FIRMS IN AREAS OF THE REGION WITH POPULATION CENTERS EXCEEDING 25,000 (cont.)

Descriptive job title category	Estimated number of workers by level of agricultural knowledge needed*				
	Technician	Post-high school technical education	Post-high school nontechnical education	High school graduation	Total
Horticulture	0	37	18	0	55
Livestock marketing	0	18	0	0	18
Poultry marketing and service	0	0	0	0	0
Seed and fertilizer	9	0	0	0	9
Miscellaneous agricultural	9	0	0	0	9
Nonagricultural	0	0	0	0	0
Total	63	82	36	0	181

* Number of workers needed in the next twelve months due to business growth and employee turnover.

When manpower needs in Type 1 business firms during the next 12 months were compared with the number of workers employed at the time interviews were conducted, the following rates of personnel change during the 12-month period were derived for each job title category.

Descriptive Job Title Category	Number of Workers Needed in Next Twelve Months for Each 100 Workers Employed When the Study Was Made
Horticulture	34
Feedmill and elevator	29
Livestock marketing	25
Agricultural machinery and construction	23
Miscellaneous agricultural	5
General agricultural sales and service	3
Seed and fertilizer	1
Poultry marketing and service	0
Nonagricultural	0

MANPOWER NEEDS AND EMPLOYMENT OPPORTUNITIES IN FARMING

Number of Workers Engaged in Farming Occupations

Census data indicate that there were 22,599 commercial farm operators in the region studied in 1959. Fifty-eight percent of the farmers--13,024--were operators of farms with annual sales of $10,000 or more. There were also 5,909 hired farm workers in the region--3,359 of whom were hired for 150 days or more per year (Table XVII).

TABLE XVII

NUMBER OF FARM WORKERS IN A FOURTEEN-COUNTY REGION OF EAST-CENTRAL ILLINOIS

Type of worker		Number of workers
Commercial farm operators (total)		22,599
Class I	Sales of $40,000 or more	771
Class II	Sales of $20,000 to $39,999	3,446
Class III	Sales of $10,000 to $19,999	8,807
Class IV	Sales of $5,000 to $9,999	6,045
Class V	Sales of $2,500 to $4,999	2,905
Class VI	Sales of $50 to $2,499	625
Hired workers		
All hired workers		5,909
Regular hired workers (150 days or more)		3,359

Source: U.S. Census of Agriculture: 1959, Volume I, Part 12 Illinois, County Tables 4, 5, and 6.

Number of Farm Operators Needed in Next Ten Years[8/]

Estimates of the number of farm operators needed during the next ten years to replace farm operators who die or retire were based on the following assumptions:

a. Farms with annual sales of $10,000 or more will provide attractive employment opportunities. Farms of this size will continue to increase in number.

b. Life expectancy rates for the total male population apply to farm operators.

8/ For the procedure used in estimating the number of farm operators needed in the next ten years see the following:

Karl Shoemaker, "Impact of Economic Changes on the Farm Community and on Opportunities for Farm Youth," Paper read at the 39th Annual Agricultural Outlook Conference, Washington, D. C. November 16, 1961.

C. E. Bishop and G. S. Tolley, "Manpower in Farming and Related Occupations," Appendix II, Education for a Changing World of Work, Report of the Panel of Consultants on Vocational Education, U.S. Office of Education, 1963

c. Essentially all farm operators 65 years of age or older in 1960 will die or retire in the next ten years.

Table XVIII indicates the age distribution of commercial farm operators in Illinois for each class of farm with annual sales of $5,000 or more. The number of farm operators in the 14-county area for each age group--Tables XIX and XX--was calculated by using these percentages of distribution.

Estimates indicate that 2,175 farm operators will be needed in the next ten years in the 14-county area to replace operators of farms with annual sales of $10,000 or more (Table XIX). If the replacement needs for operators of farms with annual sales of $5,000 or more are considered, 3,634 farm operators will be needed in the next ten years in the region studied (Table XX).

TABLE XVIII
AGE OF COMMERCIAL FARM OPERATORS IN ILLINOIS, 1959

Age groups	Percent of farm operators by economic class of farm			
	I	II	III	IV
Under 25 years	0.8	1.5	2.1	2.5
25-34 years	19.0	19.0	16.6	12.7
35-44 years	36.1	34.5	29.4	21.2
45-54 years	25.2	25.7	28.7	27.4
55-64 years	13.6	14.6	17.7	25.4
65 years and over	5.3	4.7	5.5	10.8
	100.0	100.0	100.0	100.0

Source: U.S. Census of Agriculture: 1959, Volume I, Part 12 Illinois, State Table 17.

TABLE XIX
NUMBER OF FARM OPERATORS NEEDED DURING 1960-1969
IN A FOURTEEN-COUNTY AREA OF EAST-CENTRAL ILLINOIS
(For Farms with Sales of $10,000 or More)

Age group	Number of farm operators with sales of $10,000 or more	Number of farm operators expected to die or retire, 1960-69	
		Percent	Number
Under 25 years	244	1.8*	4
25-34 years	2,263	2.6*	59
35-44 years	4,056	6.1*	247
45-54 years	3,608	14.6*	527
55-64 years	2,167	30.1*	652
65 years and over	686	100.0**	686
	13,024		2,175

* From life expectancy table.
** All are assumed to die or retire in ten years.

TABLE XX
NUMBER OF FARM OPERATORS NEEDED DURING 1960-1969
IN A FOURTEEN-COUNTY AREA OF EAST-CENTRAL ILLINOIS

(For Farms with Sales of $5,000 or More)

Age group	Number of farm operators with sales of $5,000 or more	Number of farm operators expected to die or retire, 1960-69	
		Percent	Number
Under 25 years	395	1.8*	7
25-34 years	3,031	2.6*	79
35-44 years	5,338	6.1*	326
45-54 years	5,264	14.6*	769
55-64 years	3,702	30.1*	1,114
65 years and over	1,339	100.0**	1,339
	19,069		3,634

*From life expectancy table.
**All are assumed to die or retire in ten years.

COMPARISON OF MANPOWER NEEDS IN FARMING AND NONFARM OCCUPATIONS INVOLVING KNOWLEDGE AND SKILL IN AGRICULTURE

Total Number of Workers Employed at the Time the Study Was Made

When the estimated total number of workers employed in the nonfarm business and industrial firms in the region (excluding workers in Type 2 and Type 3 businesses in areas with population centers exceeding 25,000) was added to the number of farm operators and farm workers in the region, a total of 109,336 workers resulted. The data summarized in Table XXI indicate that 41 percent of the workers--44,781--were employed in occupations involving knowledge and skill in agriculture.

TABLE XXI
TOTAL NUMBER OF WORKERS AND NUMBER OF WORKERS NEEDING KNOWLEDGE AND SKILL IN AGRICULTURE IN A FOURTEEN-COUNTY AREA OF EAST-CENTRAL ILLINOIS

Type of employment	Total number of workers employed	Number of workers needing knowledge of agriculture
Nonfarm business firms in areas of the region with population centers of less than 25,000	77,868	14,042
Type 1 nonfarm business firms in areas of the region with population centers exceeding 25,000	2,960	2,231

TABLE XXI
TOTAL NUMBER OF WORKERS AND NUMBER OF WORKERS NEEDING KNOWLEDGE AND SKILL IN AGRICULTURE IN A FOURTEEN-COUNTY AREA OF EAST-CENTRAL ILLINOIS (Cont.)

Type of employment	Total number of workers employed	Number of workers needing knowledge of agriculture
Farm operators	22,599	22,599
Hired farm workers	5,909	5,909
	109,336	44,781

For each employee needing a knowledge of agriculture employed in nonfarm business and industrial firms of the region 1.75 persons were working in farming occupations. If the number of workers in farming occupations was limited to operators of farms with annual sales of $10,000 or more and to hired workers employed for 150 days or more per year, the ratio of the number of agricultural workers in the nonfarm occupations to the number of workers in the farming occupations would be essentially one to one. It was estimated that 16,273 workers needing a knowledge of agriculture were employed in nonfarm businesses in the region. When the number of farm operators with annual sales of $10,000 or more--13,024--and the number of hired workers employed for 150 days or more--3,359--was added, a total of 16,383 persons engaged in farming occupations resulted. Hence, the one to one ratio.

Number of Workers Needed in the Future

Employment opportunities for workers needing knowledge and skill in agriculture for the 14-county region are recorded in Table XXII. These estimates of employment opportunities do not include manpower needs for Type 2 and Type 3 business firms in areas of the region with population centers exceeding 25,000. Also the estimates do not include employment opportunities for persons needing knowledge and skill in agriculture who are employed in unskilled and professional job titles in the nonfarm business and industrial firms of the region.

With the restrictions mentioned in the preceding paragraph, the data recorded in Table XXII indicate that 4,921 workers possessing knowledge and skill in agriculture will be needed during a five-year period to meet the employment demands in nonfarm businesses and the replacement needs for operators of farms with annual sales of $10,000 or more. For each farm replacement needed during the five-year period approximately 3.5 workers possessing agricultural knowledge will be needed to meet the employment demands created by growth of the nonfarm business and industrial firms in the region. If the replacement needs for farm operators with annual sales of $5,000 or more are considered, 5,651 workers possessing agricultural knowledge will be needed during a five-year period in the 14-county region. In this case, a comparison of manpower needs in farming and in nonfarm businesses reveals that slightly over two agricultural workers will be needed during the five-year period for each farm replacement needed during the same period.

TABLE XXII
EMPLOYMENT OPPORTUNITIES IN A FOURTEEN-COUNTY AREA OF EAST-CENTRAL ILLINOIS FOR WORKERS NEEDING KNOWLEDGE AND SKILL IN AGRICULTURE

Type of employment	Number workers needed in next five years	Number workers needed in next twelve months
Nonfarm business firms in areas of the region with population centers of less than 25,000[a/]	3,427[b/]	1,908[c/]
Type 1 nonfarm business firms in areas of the region with population centers exceeding 25,000[a/]	407[b/]	181[c/]
Farm operators		
With sales of $10,000 or more	1,087[d/]	217[d/]
With sales of $5,000 or more	1,817[d/]	363[d/]

a/ Unskilled laborers and workers in professional job titles not included.
b/ Number of workers needed due to business growth.
c/ Number of workers needed due to business growth and employee turnover.
d/ Calculated as a proportion of the number of farm operators needed in the next ten years (See Tables XIX and XX).

The estimates recorded in Table XXII indicate that 2,306 workers possessing knowledge and skill in agriculture will be needed during a one-year period to meet the employment needs in business and the replacement needs for operators of farms with annual sales of $10,000 or more. A comparison of employment opportunities in the farm and nonfarm occupations during a 12-month period indicates that for each farm replacement needed 9.6 workers possessing knowledge and skill in agriculture will be needed in nonfarm businesses to meet employment demands created by business growth and employee turnover. If replacement needs for operators of farms with annual sales of $5,000 or more are considered, 2,452 workers possessing knowledge and skill in agriculture will be needed during a 12-month period. In this case, 5.7 workers for nonfarm businesses will be needed for each farm replacement needed.

SUMMARY

Estimates of the number of workers needing knowledge and skill in agriculture who were employed at the time of the study and employment opportunities for these workers in areas of a 14-county region with population centers of less than 25,000 were calculated for three types of business firms. Estimates were calculated also for Type 1 business firms in areas of the region with population centers exceeding 25,000. Detailed data and information were presented for four categories of agricultural workers: (a) technicians, (b) workers needing post-high school technical education, (c) workers needing post-high school nontechnical education, and (d) workers needing high school graduation only. Excluded from the study were those workers needing a knowledge of agriculture who were employed as unskilled laborers or in professional job

titles. Comparisons were made between farm and nonfarm occupations relative to the number of workers employed and employment opportunities for workers.

It was estimated that a total of 77,868 workers were employed in nonfarm business and industrial firms in areas of the region with population centers of less than 25,000. Eighteen percent--14,042--of these workers were employed in job titles involving knowledge and skill in agricultural subjects.

Estimates indicated that a total of 2,960 workers were employed in Type 1 nonfarm business and industrial firms in areas of the region with population centers exceeding 25,000. Seventy-five percent of these workers were employed in job titles involving knowledge and skill in agricultural subjects.

Census data indicated that there were 22,599 operators of commercial farms in the 14-county region studied. There were also 5,909 hired farm workers employed in the region.

Forty-one percent of all employed workers in the region were engaged in occupations which involve knowledge and skill in agriculture. For each worker needing a knowledge of agriculture employed in nonfarm business and industrial firms of the region 1.75 persons were working in farming occupations.

It was estimated that an additional 3,427 workers--an increase of 35 percent--possessing a knowledge of agriculture will be needed during the next five years due to business growth in areas of the region with population centers of less than 25,000. Ninety-seven percent of these additional workers will be needed in job titles which necessitate some type of post-high school education. An estimated 1,908 agricultural workers will be needed in the next 12 months in areas of the region with population centers of less than 25,000 to meet the demand for workers created by business growth and employee turnover. It was estimated that 86 percent of these workers will be needed for technical jobs or jobs for which post-high school technical or nontechnical education is needed.

It was estimated that an additional 407 workers--an increase of 24 percent--possessing a knowledge of agriculture will be needed during the next five years due to business growth in areas of the region with population centers exceeding 25,000. An estimated 181 agricultural workers will be needed in the next 12 months to meet the demand for workers created by business growth and employee turnover. Employment opportunities in business and industrial firms in areas of the region with population centers exceeding 25,000 are limited primarily to those jobs for which post-high school education is considered necessary.

Estimates indicated that 1,087 farm operators will be needed during a five-year period in the 14-county area to replace operators of farms with annual sales of $10,000 or more.

For each farm replacement needed during the five-year period, approximately 3.5 workers possessing agricultural knowledge and skill will be needed to meet the demands created by growth of nonfarm business and industrial firms in the region.

A comparison of employment opportunities in the farm and nonfarm occupations during a 12-month period indicated that for each farm replacement needed 9.6 workers possessing knowledge and skill in agriculture will be needed in nonfarm businesses to meet demands created by business growth and employee turnover.

In areas of the region with population centers of less than 25,000, future employment opportunities are greatest in the following job title categories: agricultural machinery and construction, livestock marketing, seed and fertilizer, feedmill and elevator, and general agricultural sales and service.

In areas of the region with population centers exceeding 25,000, more than one-third of the additional workers needed during a five-year period in Type 1 firms due to business growth will be needed for employment in horticulture jobs. Estimates indicate also that employment opportunities in Type 1 business firms in areas of the region with population centers exceeding 25,000 can readily be found in feedmill and elevator jobs, agricultural machinery and construction jobs, and livestock marketing jobs.

APPENDIX

STATISTICAL TECHNIQUES FOR CALCULATING POPULATION ESTIMATES[1/]

All business firms in a 14-county area of East-Central Illinois were selected as the population to be studied. Individual business firms (elements) to be interviewed were selected by a two-stage, cluster sampling technique. Telephone exchanges, stratified according to the population of the largest town in each exchange, were chosen as the primary, or first stage, sampling units. A stratified random sample of primary units (telephone exchanges) was drawn. The second stage involved the selection of a stratified random sample of business firms (elements) from all business firms included in the primary units (telephone exchanges) in the sample. Business firms were categorized as to type of business (Type 1, Type 2, or Type 3) prior to the time the sample of business firms was drawn. Independent, stratified random samples were drawn for each of the three types of business firms; therefore, estimates were made independently for each type of business firm.

Data pertaining to the total number of workers employed were collected from all business firms in the sample. Detailed data and job information were obtained from all job titles in each business which required that workers possess knowledge and skills in agricultural subjects. Data were obtained for four categories of agricultural job titles: (1) technician job titles, (2) job titles which required post-high school technical education, (3) job titles which required post-high school nontechnical education, and (4) job titles which required high school graduation only.

Estimates for Areas of the Region With Population Centers of Less than 25,000

The following population (region) estimates were calculated for the three types of business firms for each of the aforementioned categories of job titles which required a knowledge of agriculture.

a. Number of workers employed at the time the study was made.

b. Number of workers employed during the past five years due to business growth and employee turnover.

c. Number of workers needed in the next five years due to business growth.

1/ Statistical techniques were derived from: William G. Cochran, Sampling Techniques, New York: John Wiley and Sons, 1953, 330 pp.

The following formula was used for calculating population estimates:

$$Y = \sum_{i=1}^{5} \frac{N_h \bar{y}_h}{m_h} M_h; \text{ where}$$

Y = Estimated number of workers (currently employed, employed in past five years, needed in next five years, or needed in next 12 months) in areas of the region with population centers of less than 25,000.

N_h= Number of business firms in the telephone exchanges (primary units) with population centers of less than 25,000 in the sample for the h^{th} stratum.

M_h= Number of telephone exchanges (primary units) with population centers of less than 25,000 in the region for the h^{th} stratum.

m_h= Number of telephone exchanges (primary units) with population centers of less than 25,000 in the sample for the h^{th} stratum.

$\bar{y}_h$= Average number of workers per business firm in the sample for areas with population centers of less than 25,000 for the h^{th} stratum when;

$$\bar{y}_h = \frac{\sum_{i=1}^{n_h} y_h}{n_h}$$

$\sum y_h$ = Total number of workers in the business firms in the sample for the h^{th} stratum.

n_h = Number of business firms in the sample for the h^{th} stratum.

Estimates for Areas of the Region with Population Centers Exceeding 25,000

alculated also for Type 1 business firms in nters exceeding 25,000. The formula used follows:

$Y = \frac{N\bar{y}}{m} M$; where

Y = Estimated number of workers (currently employed, employed in past five years, needed in next five years, or needed in next 12 months) in Type 1 business firms in areas of the region with population centers exceeding 25,000.

N = Number of Type 1 business firms in the telephone exchanges (primary units) with population centers exceeding 25,000 in the sample.

M = Number of telephone exchanges (primary units) with population centers exceeding 25,000 in the region.

m = Number of telephone exchanges (primary units) with population centers exceeding 25,000 in the sample.

$\bar{y}$ = Average number of workers per Type 1 business firm in the sample for areas with population centers exceeding 25,000 when:

$$\bar{y} = \frac{\sum y}{n}$$

$\sum y$ = Total number of workers in the Type 1 business firms in the sample.

n = Number of Type 1 business firms in the sample.

NUMBER OF TELEPHONE EXCHANGES AND BUSINESS FIRMS IN THE REGION AND IN THE SAMPLE

Population stratum	Number telephone exchanges in region	Number telephone exchanges in sample	Type 1 business firms		Type 2 business firms		Type 3 business firms	
			Number firms in telephone exchanges in sample	Number firms in sample	Number firms in telephone exchanges in sample	Number firms in sample	Number firms in telephone exchanges in sample	Number firms in sample
Less than 1,000	123	32	129	54	330	45	323	33
1,000-2,500	37	7	110	45	228	34	367	40
2,500-5,000	12	2	15	7	76	12	129	13
5,000-10,000	3	1	30	15	110	17	174	18
10,000-25,000	4	1	13	7	123	19	241	25
Total less than 25,000	179	43	297	128	867	127	1,234	129
More than 25,000	4	1	86	38	--	--	--	--

JRW:ds
6-7-66